Geophysical Research Abstracts
Vol. 15, EGU2013-8631, 2013
EGU General Assembly 2013


# Adaptive analog-SSOR iterative method for solving grid equations with nonselfadjoint operators

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Motion models of wave processes in the coastal zone are highly demanded in the projection and construction of coastal surface structures and breakwaters, and also as a component of other models. The most common of the grid approaches is currently vof-method. A significant drawback of this method is in the necessity to solve the convection equation to find fullness of cells. The numerical solution of this equation leads to a strong grid viscosity and "smearing" of the interface. In this paper, we propose a method, which is based on the idea of using a fill, as in vof method, but its conversion is not required to solve the equation of convection.
Thus in this work, a mathematical model for the wave hydrodynamics problem, describing wash ashore and taking into account such physical parameters as turbulent exchange, complexity of domain and coastal line geometry, and bottom friction is developed. For the given mathematical model a discrete model is constructed, taking into account dynamical changing of the calculation domain. Discretization of the model is performed on the structured rectangular grid with a new developed finite-volume technique that takes into account fullness of the grid cells that allows describing geometry more accurate. Proposed technique allows improving the real accuracy of a solution in case of complex domain geometry, by improving approximation of the boundary. A software implementation and numerical experiments of the posed problem of the wave hydrodynamics is performed.
The results of numerical experiments show the feasibility of using discrete mathematical models of processes that take into account fullness of grid cells, for the simulation of systems with complex geometry of the border. Numerical experiments show that the use of this technique sufficiently smooth solutions are obtained even on coarse grids.